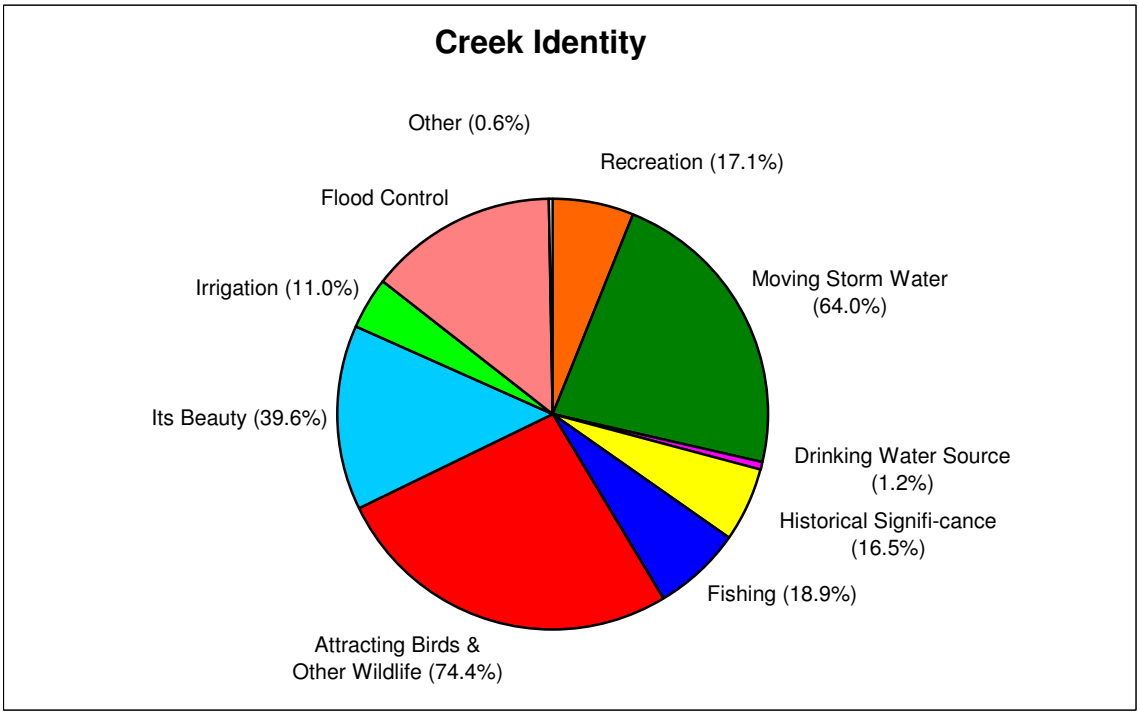
Landowner Survey

In 2001 the Lake County Soil and Water Conservation District contacted over 800 landowners in the watershed with a survey. This survey was designed to gain an understanding of the issues affecting those landowners. The survey covered topics such as creek identity, rating the watershed, landowner interests, harming the watershed, protecting the creeks, general opinions, and Mentor Marsh Watershed opinions. The survey had a response rate of over 20%, signifying that landowners in the watershed are concerned about natural resource issues. The results of the survey were analyzed and a "Mentor Marsh Watershed Landowner Survey Summary" was created by the Lake SWCD for use by the MARC:

Creek Identity

When asked to identify what the Mentor Marsh Watershed is best known for, the top four characteristics were identified as (1) attracting birds and other wildlife, (2) moving storm water, (3) flood control, and (4) it's beauty. The percentage of landowners identifying these four, as well as the other six characteristics from which they were given to chose, are depicted in the pie chart below. These responses seem to indicate that landowners recognize the wildlife potential afforded by the watershed, understand issues associated with moving storm water through the watershed, understand the importance of flood control measures, and take pride in the beauty that it offers.

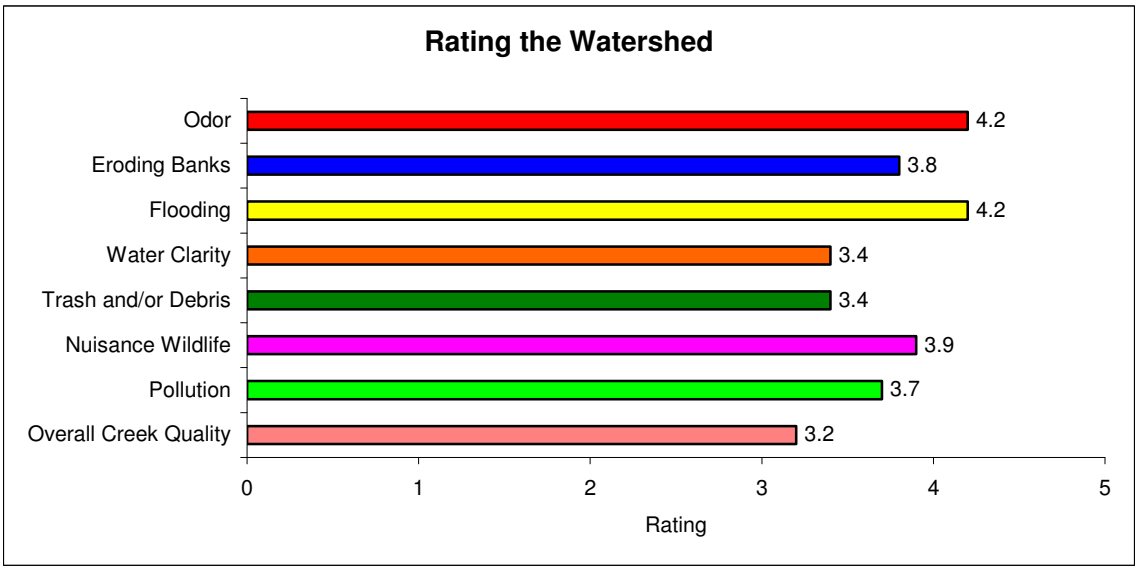
Graph 1. Creek Identity



Rating the Watershed

The initial survey question asked respondents to give their piece of the Mentor Marsh watershed an overall rating, or score. On average, landowners rated their stretch of the creek just above average (an average of 3.2 out of 5, with 5 being the highest quality). Of the other seven issues on which we asked respondents to rate the Watershed, flooding and odor were the least problematic, while trash and debris and water clarity tied for the items that were the most problematic.

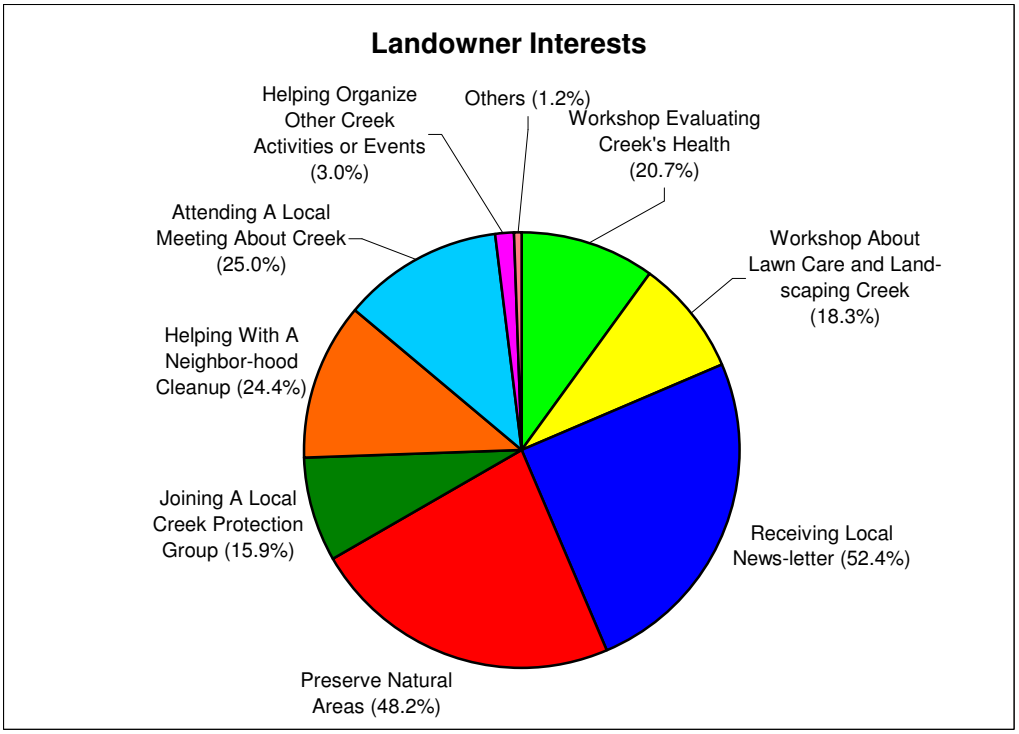
Graph 2. Rating the Watershed



Landowner Interests

With respect to landowners' interests, the top two interests were receiving a newsletter about the watershed and preserving natural areas along the creeks. A large number of responders also indicated that creek workshops would be of interest, as would be attending a local creek meeting and helping with a neighborhood cleanup.

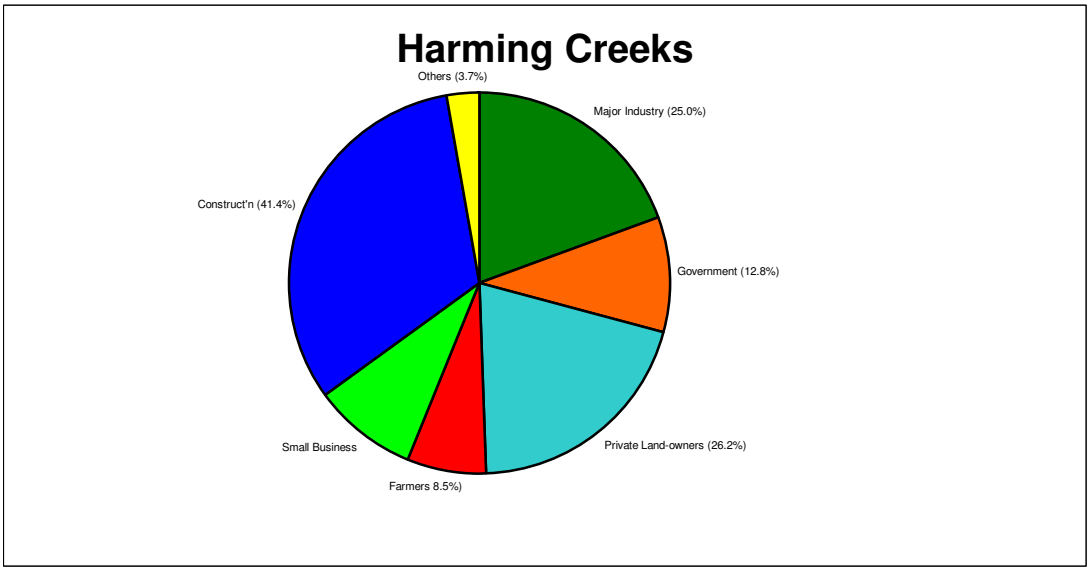
Graph 3. Landowner Interests



Harming the Watershed

Landowners in the Mentor Marsh watershed identified activities associated with construction and those of private landowners that do the most harm to creeks, major industries was also ranked very high. The 'other' category consisted of landowners that thought that the most harm is done by a combination of all the choices given.

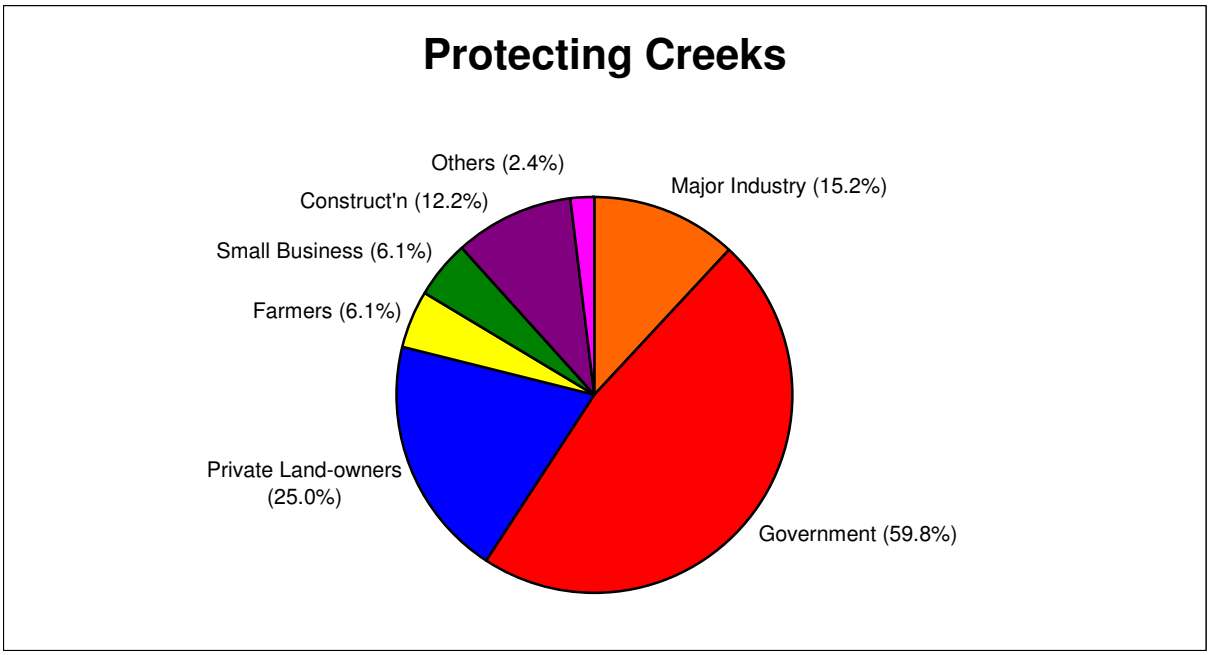
Graph 4. Harming Creeks



Protection the Creeks

When given the choice of who should be responsible for protecting creeks, it was suggested that government and private landowners should be the two groups most responsible for protecting them. The 'other' category consisted of landowners that thought that protecting creeks should be from all of the parties given as choices.

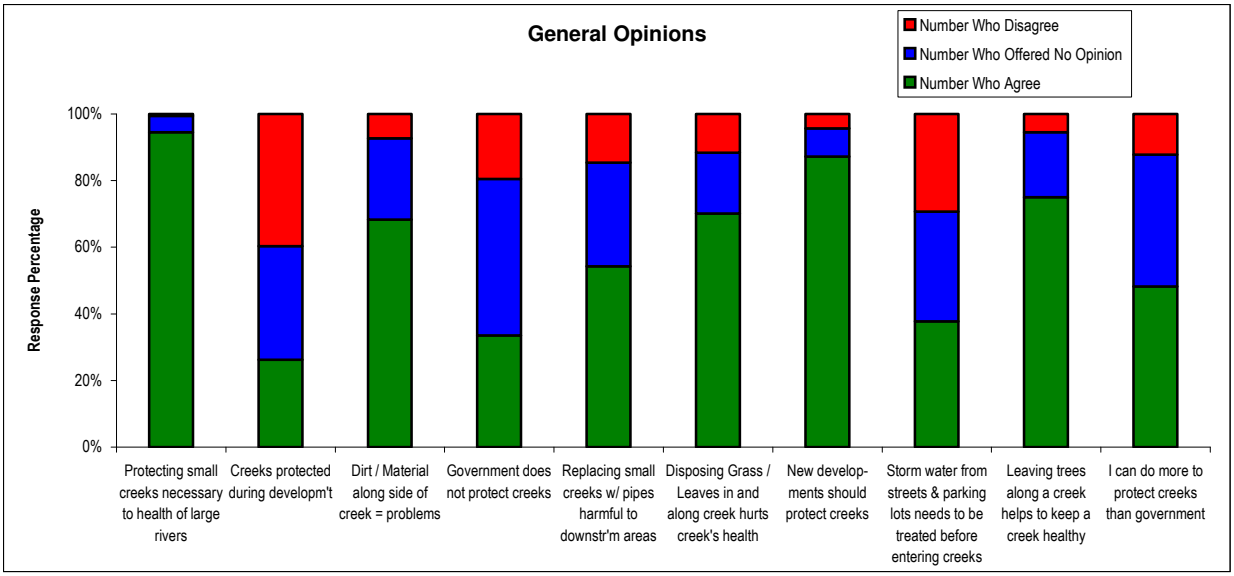
Graph 5. Protecting Creeks



General Opinions

An overwhelming majority of respondents recognized that protecting small creeks is necessary to the health of larger rivers. When asked if creeks were protected during development, the majority disagreed, but a vast majority agreed that new developments SHOULD protect creeks. A significant number of respondents recognized that placing dirt, grass clippings, leaves, or other material along or in a creek hurts the creek's health and causes problems. Further, it was encouraging to see that numerous respondents recognized that leaving trees along a creek's bank helps keep a creek healthy.

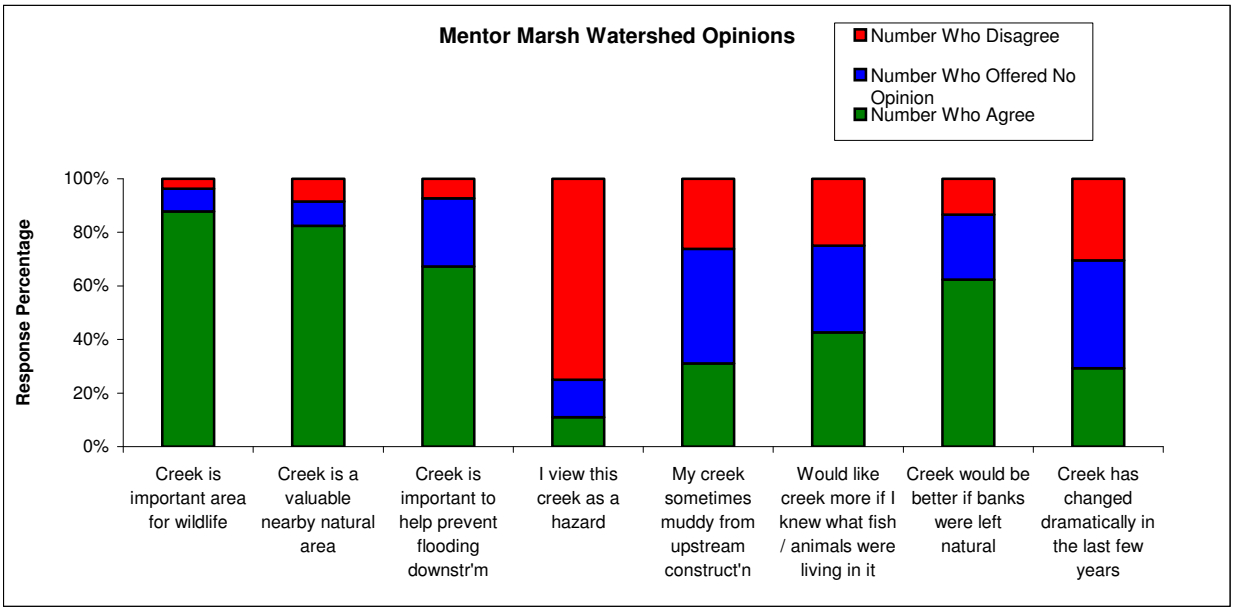
Graph 6. General Opinions



Watershed Opinions

A majority of respondents recognized that this is an important area for wildlife as well as a valuable nearby natural area. Also, a large number agreed that this helps to prevent flooding downstream. It was nice to see that a great number do not believe that this is a hazard. Significantly more agreed than disagreed with the statement that they would like the creek more if they knew what fish or animals were living in it. A significant proportion also agreed that the creek would be better if the banks were left natural. Although erosion can be quite problematic in some areas, it is important to attempt to keep the banks as natural as possible rather than armoring them with concrete, metal pilings, or other unnatural materials. Interestingly, there was no significant difference in the responses that indicated the creek has changed dramatically in the last few years as compared to those that indicated the creek has not changed dramatically.

Graph 7. Watershed Opinions



Inventory of Natural Resources

Physiography and Geology

With the exception of a very small portion, the Mentor Marsh Watershed is located entirely within the Lake Plain Physiographic Region. The exception is a portion of an escarpment, or end moraine belt, which marks the boundary between the Lake Plain Region and the Allegheny Plateau (White, 1980). This escarpment is located along the 760 ft contour and is located in the southern portion of the watershed in Mentor and Concord Township (Figure 4). The surficial materials over the bedrock range in thickness from 20 to 40ft in the northeastern portion of the watershed to over 120ft along the escarpment. (Figure 5) The Lake Plain Region is typified by glacial sediment, overlaying Devonian shale, ranging from fine sand, silt and clay. (Figure 6)

> "The Lake Plain is a level surface 3 to 5 miles wide and poorly drained in most places. The plain declines from an elevation of 760 feet at the base of the Painesville Moraine to 600-620 feet at the top of the cliff rising above Lake Erie. The surface is marked by several sand ridges, which contain some gravel and which mark the locations of shores of former higher levels of late-glacial Lake Erie. These ridges, which rise from 10 to 30 feet above the Lake Plain, are well drained, and from the earliest days main highways were located along North Ridge, South Ridge, and, at places, Middle Ridge." (White, 1980)

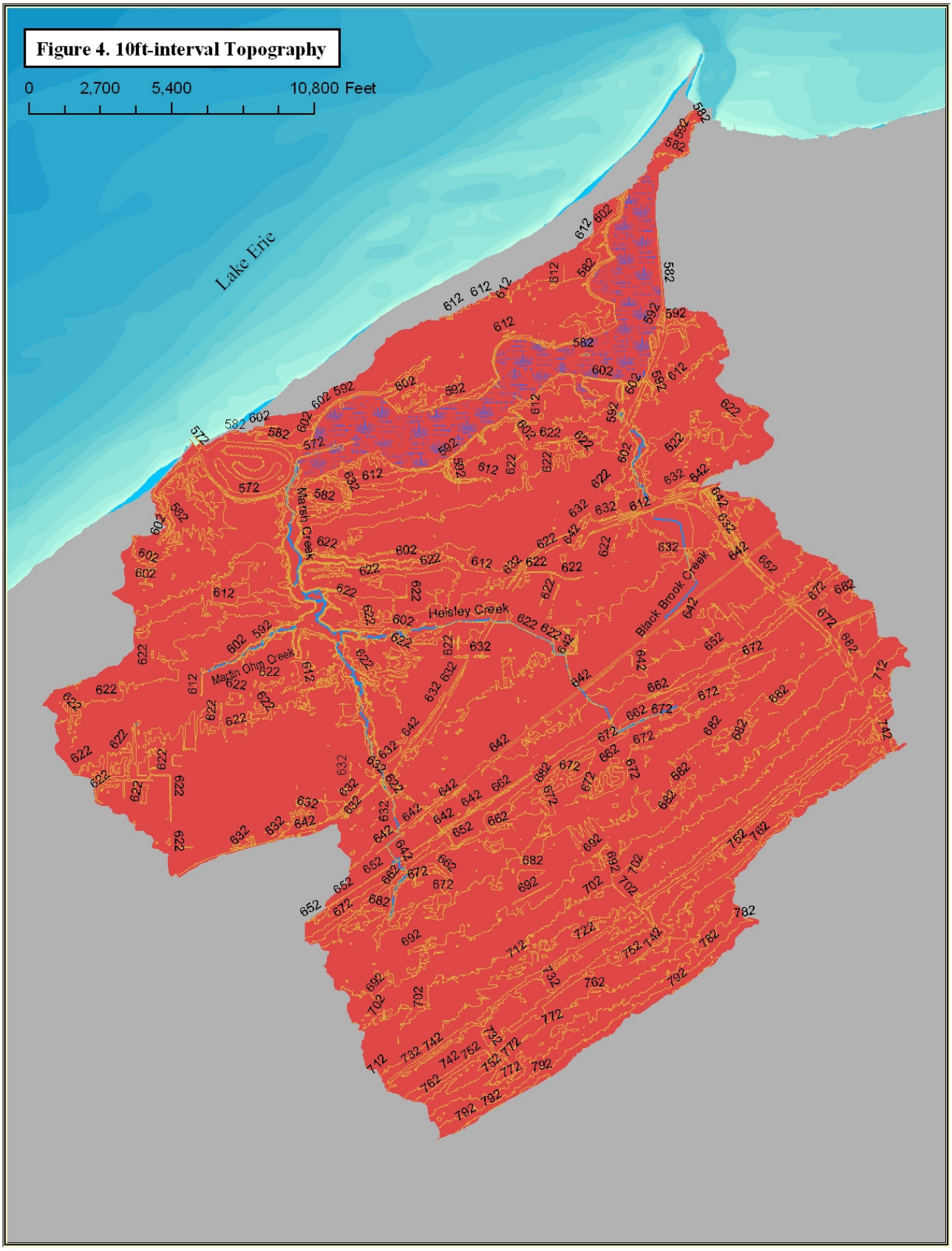


Figure 4. 10ft-interval Topography
0
2,700
5,400
10,800 Feet
Lake Erie
Marsh Creek
Martin Ohm Creek
Heisley Creek
Black Brook Creek

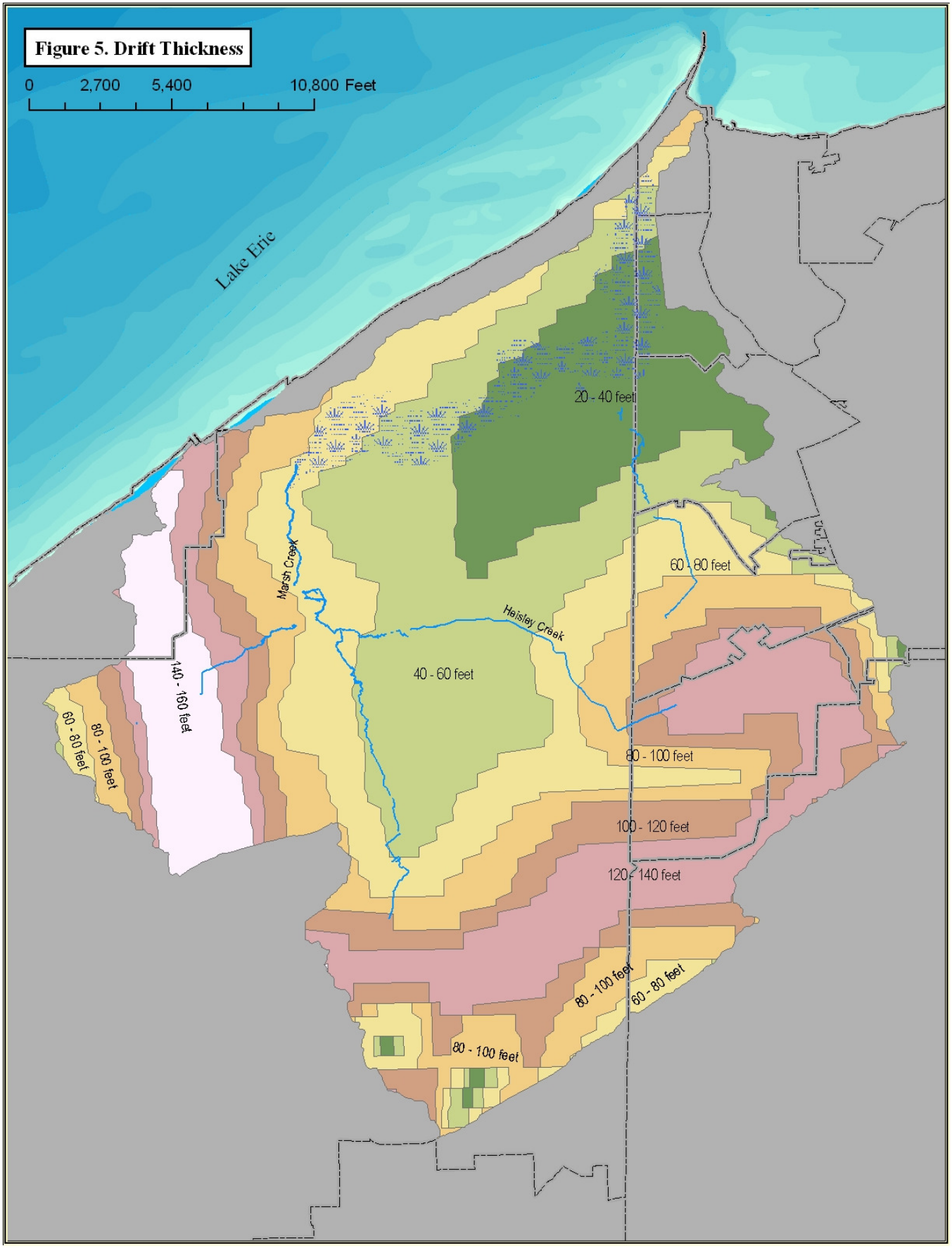


Figure 5. Drift Thickness
0
2,700
5,400
10,800 Feet
Lake Erie
20 - 40 feet
60 - 80 feet
Marsh Creek
Heisley Creek
40 - 60 feet
140 - 160 feet
60 - 80 feet
80 - 100 feet
80 - 100 feet
100 - 120 feet
120 - 140 feet
80 - 100 feet
60 - 80 feet
80 - 100 feet

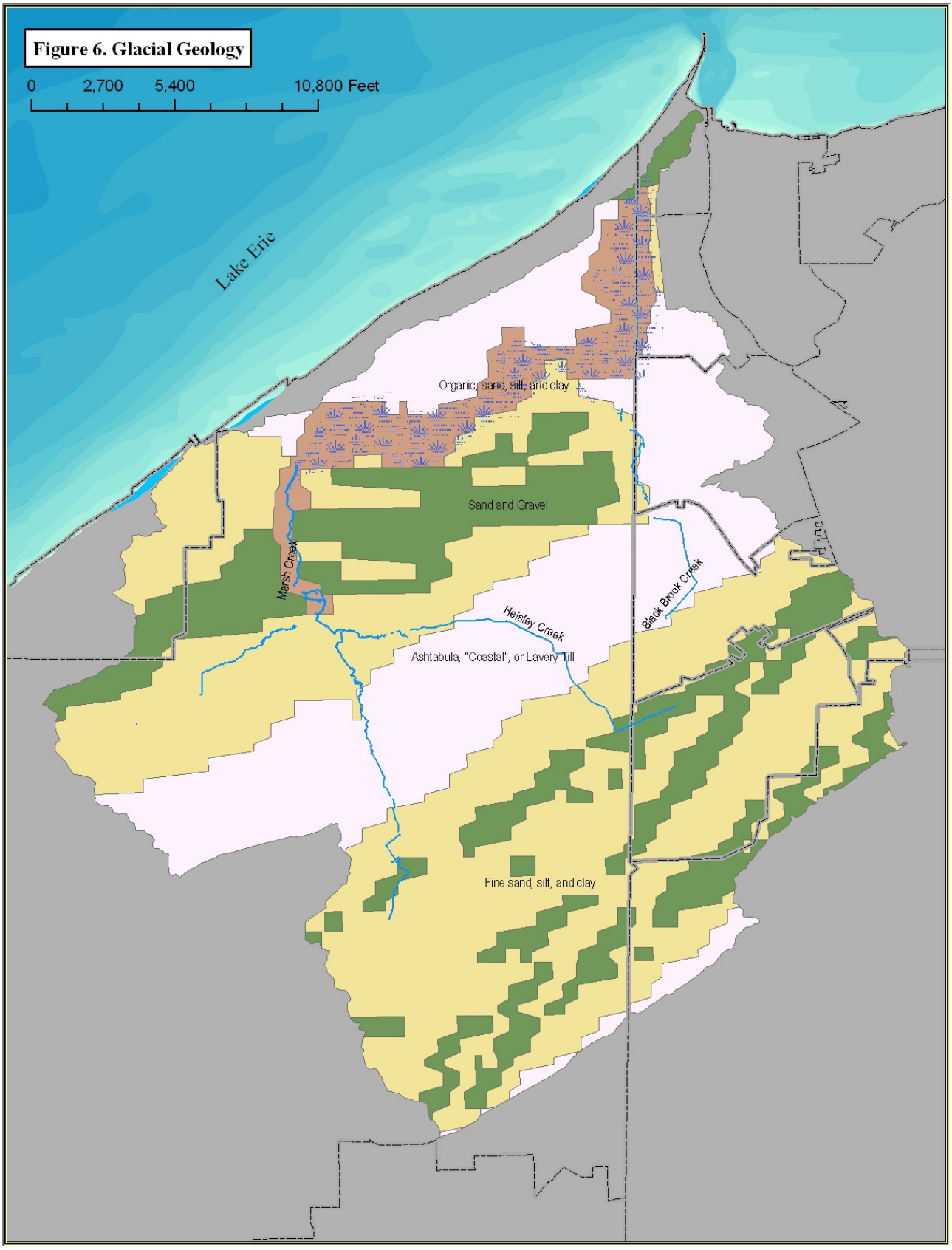


Figure 6. Glacial Geology
0
2,700
5,400
10,800 Feet
Lake Erie
Organic, sand, silt, and clay
Sand and Gravel
Marsh Creek
Black Brook Creek
Heisley Creek
Ashtabula, "Coastal", or Lavery Till
Fine sand, silt, and clay

Soils

A total of 28 different soil types were identified in the Mentor Marsh Watershed. The Mentor Marsh is made up entirely of Carlisle Muck (Cg) which formed as the relic Grand River channel and floodplain became a wetland. The following is a description of each soil type of the Soil Survey of Lake County. The soils are listed with the amount of that particular soil type found in the watershed.

CtA -- Conneaut silt loam, 0 to 1 percent slopes (2803.7-acres)
This deep, level, poorly drained soil is the dominant soil on the lake plain. Areas are 0.5 to 1 mile wide.
This soil has a seasonal high water table near the surface for long periods in winter, spring, and early summer. It dries and warms slowly in spring. Permeability is slow, and available water capacity is high in the rooting zone. Rooting depth is related to the depth of the water table. The rooting zone is deep in drained areas. Organic matter content is moderately low. The surface layer and subsoil are very strongly acid to neutral.
Seasonal wetness and slow permeability severely limit use of this soil for building sites and sanitary facilities. Surface drains and storm sewers can be used to remove surface water. Local roads can be improved by using artificial drainage and suitable base material.

Table 2. CtA Limitations

CHARACTERISTIC/USES	LIMITATIONS
Dwellings without basements	Severe: wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Severe: wetness, frost action & low strength
Septic tank absorption fields	Severe: wetness, percs slowly
Flooding frequency	None
High water table	Perched - Nov. thru June at depths of 0 - 1.0 feet
Bedrock depth	Greater than 60 inches

TyB -- Tyner loamy sand, 1 to 6 percent slopes (2682.4)
This deep, nearly level and gently sloping, well drained soil is on the upper part of side slopes and crests of post-glacial beach ridges. Most areas are long and narrow in shape and range from 20-acres to several hundred acres in size.
This soil warms and dries early in spring. Permeability is rapid. Runoff is slow. Available water capacity is low in the deep rooting zone. This soil is droughty. Organic matter content is low. The subsoil is strongly acid to slightly acid, but the surface layer varies widely in reaction, depending on the amount of liming.
This soil is suitable for building sites. The possible contamination of ground water limits the use of this soil for sanitary facilities. Lawn seedings are difficult to establish during the drier part of the year. Lawns should be seeded early in spring; if seeded during dry periods, they should be mulched and watered.

Table 3. TyB Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Slight
Dwellings with basements	Slight
Local roads and streets	Slight
Septic tank absorption fields	Slight
Flooding frequency	None
High water table	Greater than 6 feet
Bedrock depth	Greater than 60 inches

Pa -- Painesville fine sandy loam (2503.5-acres)

This deep, nearly level, somewhat poorly drained soil is on sandy, low ridges and slight rises on the lake plain. Slope ranges from 0 to 2 percent. Most areas are several hundred acres in size, but a few are as small as 20-acres.

A seasonal high water table is between depth of 6 and 18 inches for long periods in winter, spring, and other extended wet periods. In undrained areas the soil dries slowly in spring. Permeability is slow or moderately slow. Runoff is slow. The rooting zone is mainly above the water table. In drained areas the rooting zone is deep and available water capacity is high. Organic matter content is moderately low. The subsoil is strongly acid to slightly acid.

The seasonal high water table severely limits the use of this soil for sanitary facilities and for building sites. Houses without basements are better suited to this soil than those with basements. Mechanical measures may be used to help to prevent wet basements. Local roads can be improved by using artificial drainage and suitable base material. Wetness also limits use of this soil for recreation.

Table 4. Pa Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Severe: wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Severe: frost action, wetness
Septic tank absorption fields	Severe: wetness, percs slowly
Flooding frequency	None
High water table	Perched - Jan. thru April at depths of 0.5 - 1.5 feet
Bedrock depth	Greater than 60 inches

CtB -- Conneaut silt loam, 1 to 4 percent slopes (1117.1-acres)

This deep, level, poorly drained soil is the dominant soil on the lake plain. Areas are 0.5 to 1 mile wide.

This soil has a seasonal high water table near the surface for long periods in winter, spring, and early summer. It dries and warms slowly in spring. Permeability is slow, and available water capacity is high in the rooting zone. Rooting depth is related to the depth of the water table. The rooting zone is deep in drained areas. Organic matter content is moderately low. The surface layer and subsoil are very strongly acid to neutral.

Seasonal wetness and slow permeability severely limit use of this soil for building sites and sanitary facilities. Surface drains and storm sewers can be used to remove surface water. Local roads can be improved by using artificial drainage and suitable base material.

Table 5. CtB Limitations

CHARACTERISTIC/USES	LIMITATIONS
Dwellings without basements	Severe: wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Severe: wetness, frost action & low strength
Septic tank absorption fields	Severe: wetness, percs slowly
Flooding frequency	None
High water table	Perched - Nov. thru June at depths of 0 - 0.5 feet
Bedrock depth	40 to 60 inches

RhA -- Red Hook sandy loam, 0 to 2 percent slopes (1084.9-acres)

This deep, nearly level, somewhat poorly drained soil is on low beach ridges and offshore bars on the lake plain. Most areas are long and narrow in shape and range from 10 to 500-acres in size.

In undrained areas this soil has a seasonal high water table at a depth of 6 to 18 inches during winter, spring and other extended wet periods. Permeability is moderate or moderately slow. Runoff is slow. Rooting depth is influenced by the water table. In spring, the rooting zone is mainly the upper 15 to 20 inches. Available water capacity is moderate. Organic matter content is moderately low. The subsoil is medium acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.

The seasonal high water table severely limits the use of this soil for most sanitary facilities and for building sites. Ditches to control the water table are effective to some extent if outlets are available. Houses without basements are better suited to this soil than those with basements. Excavation is limited during winter and spring by the high water table and caving of banks. Wetness also limits use of this soil for recreation.

Table 6. RhA Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Severe: wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Severe: frost action, wetness
Septic tank absorption fields	Severe: wetness
Flooding frequency	None
High water table	Apparent - Dec. thru May at depths of 0.5 - 1.5 ft
Bedrock depth	Greater than 60 inches

Cg -- Carlisle muck (798.5-acres)

This deep, level, very poorly drained organic soil is in a marsh. It is subject to frequent flooding. Slope is less than 2 percent. This soil is in one large, elongated area about 800-acres in size.

This soil has water near the surface, and the surface is ponded for long periods. Permeability is moderately rapid in the organic layer and moderately slow in the substratum. The rooting depth is related to the depth of the water table. The rooting zone is mainly the upper 10 to 12 inches. Available water capacity and organic matter content are very high. The organic material is medium acid to neutral.

This soil is used as a natural area with cattails, reeds, sedges, and some water-tolerant trees near the periphery. It has poor potential for most uses other than wetland wildlife habitat.

Flooding, wetness, and low strength seriously limit use of this soil for building sites and sanitary facilities. This soil provides good habitat for ducks, muskrats, and other wetland wildlife.

Table 7. Cg Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Severe: wetness, low strength, floods
Dwellings with basements	Severe: wetness, low strength, floods
Local roads and streets	Severe: excess humus, wetness, floods
Septic tank absorption fields	Severe: floods, wetness
Flooding frequency	Frequent - long duration - Nov. thru May
High water table	Apparent- Sep. thru June at depths of 0 - 1.0 feet
Bedrock depth	Greater than 60 inches

UdD -- Udorthents, moderately steep (498.6-acres)

These soils are in cut and fill areas created by road construction. Where the soil material has been removed, the remaining soil is typically similar to the material in the subsoil or substratum of adjacent soils. In fill or disposal areas, the soil material has more variable characteristics because it usually consists of varying amounts of materials from the subsoil and substratum of nearby soils. Slope ranges from 12 to 18 percent.

Typically, these soils are shaly silty clay loam, clay loam, or silt loam in the upper 60 inches. Available water capacity varies, but is mostly low. Permeability is generally slow. The soils have poor tilth. Hard rains tend to seal the surface, reducing infiltration and restricting seedling emergence and growth. The rooting zone ranges from medium acid to mildly alkaline.

Most of the acreage of these soils is along highways and in borrow pits. About half of the areas lack any plant cover. They are poorly suited to grasses and legumes. The hazard of erosion is severe in areas that are bare of vegetation. A suitable plant cover is needed to reduce erosion.

OtB -- Otisville gravelly loamy sand, 1 to 6 percent slopes (412.1-acres)

This deep, nearly level and gently sloping, excessively drained soil is on the upper part of sides and crests of postglacial beach ridges. Most areas are long and narrow in shape and range from 20 to several hundred acres in size.

This soil dries and warms early in spring. Permeability is rapid, and runoff is slow. Available water capacity is low in the deep rooting zone. This soil is droughty. Organic matter content is low. The surface layer and subsoil are strongly acid or very strongly acid, except where the surface layer has been limed.

This soil is suitable for building sites. The possible contamination of ground water limits the use for sanitary facilities. Lawn seedings are difficult to establish during the drier part of the year. Lawns should be seeded early in spring; if seeded during dry periods, they should be mulched and watered. This soil is a good source of sand and gravel.

Table 8. OtB Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Slight
Dwellings with basements	Slight
Local roads and streets	Slight
Septic tank absorption fields	Slight
Flooding frequency	None
High water table	Greater than 6 feet
Bedrock depth	Greater than 60 inches

PsB -- Platea silt loam, 2 to 6 percent slopes (380.1-acres)
This deep, nearly level, somewhat poorly drained soil is on slightly convex side slopes on the uplands. Most slopes are long with slight irregularities. Many areas are broad and commonly are more than 100-acres in size.
A perched seasonal high water table is above the very slowly permeable fragipan in winter, spring, and other extended wet periods. This soil dries slowly in spring. Runoff is medium. The rooting zone is mainly 24 to 28 inches deep over the fragipan. Available water capacity is low in the rooting zone. Organic matter content is moderately low. The subsoil above the fragipan is very strongly acid to medium acid, but the surface layer varies widely in reaction, depending on the amount of liming.
Seasonal wetness and the very slowly permeable fragipan severely limit the use of this soil for building sites and sanitary facilities. Houses without basements are better suited to this soil than those with basements. Local roads can be improved by using artificial drainage and suitable base material. Some areas are good pond sites.

Table 9. PsB Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Severe: wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Severe: low strength, wetness, frost action
Septic tank absorption fields	Severe: percs slowly, wetness
Flooding frequency	None
High water table	Perched - Jan. thru April at depths of 0.5 - 2.0 feet
Bedrock depth	Greater than 60 inches

Or -- Orrville silt loam (353.5-acres)
This deep, nearly level, somewhat poorly drained soil is on flood plains and is subject to flooding. Slope ranges from 0 to 2 percent. This soil occupies the entire flood plain in some narrow valleys and occurs as long, narrow strips on the flood plain in the larger valleys. Most areas range from 10 to 100-acres in size.
A seasonal high water table is near the surface for long periods in winter, spring, and early summer. Permeability is moderate, and runoff is very slow. Rooting depth is influenced by the water table. In drained areas the rooting zone is deep and available water capacity is moderate. Organic matter content is moderately low. The subsoil is strongly acid to slightly acid, but the surface layer varies widely in reaction, depending on the amount of liming.
Flooding and seasonal wetness seriously limit the use of this soil for building sites and sanitary facilities.

Table 10. Or Limitations

CHARACTERISTIC/USES	LIMITATIONS
Dwellings without basements	Severe: floods, wetness
Dwellings with basements	Severe: floods, wetness
Local roads and streets	Severe: floods, frost action, low strength
Septic tank absorption fields	Severe: floods, wetness
Flooding frequency	Common - very brief to brief - November thru May
High water table	Perched - Nov. thru June at depths of 0.5 - 1.5 feet
Bedrock depth	Greater than 60 inches

CyB -- Conotton gravely loam, 2 to 6 percent slopes (246.0-acres)
This deep, gently sloping, somewhat excessively drained soil is on the upper part of sides and crests of post-glacial beach ridges. Most areas are long and narrow in shape and range from 10 to 30-acres in size.
Permeability is rapid, and available water capacity is low in the deep rooting zone. This soil warms early in spring. Runoff is slow or medium. The organic matter content is low. The subsoil is very strongly acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.
This soil is well suited to building sites. Possible contamination of ground water limits the use for sanitary facilities. Gravel interferes with most recreational uses. Lawn seedings are difficult to establish during the drier part of the growing season. Seeding should be done early in spring; if seeded during dry periods, lawns should be mulched and watered.

Table 11. CyB Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Slight
Dwellings with basements	Slight
Local roads and streets	Moderate: frost action
Septic tank absorption fields	Slight
Flooding frequency	None
High water table	Greater than 6 feet
Bedrock depth	Greater than 60 inches

UdB -- Udorthents, gently sloping (210.0-acres)
These soils are in cut and fill areas. Where the soil material has been removed, the remaining soil is typically similar to the material in the subsoil or substratum of adjacent soils. In fill or disposal areas, the soil material has more variable characteristics because it usually consists of varying amounts of materials from the subsoil and substratum of nearby soils. Slope ranges from 2 to 6 percent.
Typically, these soils are silty clay loam, clay loam, or silt loam in the upper 60 inches. Available water capacity varies, but is mostly low. Permeability is generally slow. The firm and dense surface layer is commonly littered with shale fragments. The soils have poor tilth. Hard rains tend to seal the surface, reducing infiltration and restricting seedling emergence and growth. A seasonal high water table is in some areas, particularly where grading has resulted in depressed or bowl-shaped areas. The rooting zone is medium acid to mildly alkaline.
Most areas of these soils are at new construction sites. About half of the areas lack any plant cover. A few areas are in hay or pasture. The hazard of erosion is severe in areas that are bare of vegetation. A suitable plant cover is needed to protect these soils from erosion. The suitability of these soils for building sites and sanitary facilities is quite variable.

TzA -- Tyner Variant sandy loam (187.6-acres)
This deep, nearly level, moderately well drained soil is on low ridges on the lake plain. Slope ranges from 0 to 2 percent. Most areas are irregular in shape and range from 5 to 50-acres in size.
A seasonal high water table is at a depth of 18 to 36 inches in winter, spring, and other extended wet periods. Permeability is rapid. Runoff is slow. This soil is droughty. Available water capacity is low in the deep rooting zone. The organic matter content is low. The subsoil is

strongly acid or medium acid, but the surface layer varies widely in reaction, depending on the amount of liming.
Seasonal wetness and rapid permeability limit the use of this soil for building sites and sanitary facilities. It is better suited to houses without basements than to those with basements. Mechanical measures may be used to help to prevent wet basements. Because of seepage, contamination of ground water from sanitary facilities is possible. Sloughing is a hazard in excavations. If lawns are seeded during dry periods, they should be mulched and watered.

Table 12. TzA Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Moderate: wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Moderate: frost action, wetness
Septic tank absorption fields	Severe: wetness
Flooding frequency	None
High water table	Apparent - Jan. thru May at depths of 1.5 - 3.0 feet
Bedrock depth	Greater than 60 inches

Sw -- Swanton fine sandy loam (175.5-acres)
This deep, nearly level, poorly drained soil is in relatively broad, elongated strips on the lake plain. Slope ranges from 0 to 2 percent. Most areas range from 5 to 100-acres in size.
A seasonal high water table is near the surface for long periods. Permeability is moderately rapid in the subsoil and slow or very slow in the substratum. Runoff is very slow. Rooting depth is influenced by the water table and generally is restricted by the finer textured substratum. Available water capacity is moderate in the rooting zone. Organic matter content is moderate. The surface layer and subsoil are neutral to strongly acid.
The seasonally high water table severely limits the use of this soil for building sites, sanitary facilities, and recreation. The slow or very slow permeability in the substratum limits some uses. Local roads can be improved by using artificial drainage and suitable base material.

Table 13. Sw Limitations

CHARACTERISTIC/USES	LIMITATIONS
Dwellings without basements	Severe: wetness, shrink-swell
Dwellings with basements	Severe: wetness, shrink-swell
Local roads and streets	Severe: wetness, frost action , shrink-swell
Septic tank absorption fields	Severe: wetness, percs slowly
Flooding frequency	None
High water table	Apparent - Nov. thru May at depths of 0 - 1.0 feet
Bedrock depth	Greater than 60 inches

Kf -- Kingsville fine sand (164.1-acres)
This deep, nearly level, very poorly drained, sandy soil is adjacent to beach ridges. Slope ranges from 0 to 2 percent. Most areas are long and narrow in shape and range from 5 to several hundred acres in size.
This soil receives seepage water from the beach ridges. It has a seasonal high water table near the surface in winter, spring, and other extended wet periods. Permeability is rapid, and runoff is very slow. Rooting depth is related to the depth of the water table. Available water subsoil is very strongly acid to slightly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Wetness and rapid permeability severely limit the use of this soil for building sites and sanitary facilities. Sloughing is a hazard in excavations. Wetness also limits recreational use.

Table 14. Kf Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Severe: wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Severe: wetness
Septic tank absorption fields	Severe: wetness
Flooding frequency	None
High water table	Apparent - Jan. thru April at depths of 0 - 1.0 feet
Bedrock depth	Greater than 60 inches

E1F -- Ellsworth silt loam, 25 to 70 percent slopes (163.8-acres)

This deep, very steep, moderately well drained soil is on hillsides and sides of V-shaped valleys formed by deeply entrenched drainageways. Typically, slopes are short. Most areas are long and narrow in shape and generally are larger than 50-acres in size.

The water table is generally between depths of 1.5 and 3.0 feet during winter, spring, and other excessively wet periods. This soil dries slowly in spring. Permeability is slow or very slow. Runoff is very rapid. The rooting zone is moderately deep over glacial till. Available water capacity is moderate. Organic matter content is moderately low. The surface layer and upper part of the subsoil are very strongly acid to neutral, and the lower part of the subsoil is slightly acid to mildly alkaline.

This soil is moderately well suited to woodland. The hazard of erosion is severe. The very steep slope limits use of logging equipment. Construction of buildings and sanitary facilities is very difficult because of the very steep slope. Also, the hazard of erosion is very severe when vegetation is removed. Trails in recreational areas should be protected from erosion and established across the slope wherever possible.

Table 15. ElF Limitations

CHARACTERISTIC/USES	LIMITATIONS
Dwellings without basements	Severe: slope
Dwellings with basements	Severe: slope, wetness
Local roads and streets	Severe: slope, low strength, frost action
Septic tank absorption fields	Severe: slope, percs slowly, wetness
Flooding frequency	None
High water table	Perched - Nov. thru May at depths of 1.5 - 3.0 feet
Bedrock depth	Greater than 60 inches

TyC -- Tyner loamy sand, 6 to 12 percent slopes (120.9-acres)

This deep, sloping, well drained soil is on sides of post-glacial ridges. Slopes are short. Most areas are long and narrow in shape and range from 5 to 10-acres in size.

This soil warms and dries early in spring. Permeability is rapid. Runoff is medium or rapid. This soil is droughty. Available water capacity is low in the deep rooting zone. Organic matter content is low. The subsoil is strongly acid to slightly acid, but the surface layer varies widely in reaction, depending on the amount of liming.

Although slope limits the use of this soil for building site, many areas are good building sites. The possible contamination of ground water limits the use of this soil for sanitary facilities. Lawn seedings are difficult to establish during the drier part of the growing season unless they are mulched and watered.

Table 16. TyC Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Moderate: slope
Dwellings with basements	Moderate: slope
Local roads and streets	Moderate: slope
Septic tank absorption fields	Moderate: slope
Flooding frequency	None
High water table	Greater than 6 feet
Bedrock depth	Greater than 60 inches

St -- Stafford loamy fine sand (96.8-acres)

This deep, nearly level, somewhat poorly drained soil is on low sandy ridges on the lake plain. Slope ranges from 0 to 2 percent. Most areas of this soil are irregular in shape and range from 10-acres to several hundred acres in size.

A seasonal high water table is near the surface for long periods in winter, spring, and other extended wet periods. Permeability is moderately rapid or rapid. Runoff is slow. Rooting depth is related to the depth of the water table. Drained areas have a deep rooting zone. Available water capacity is very low. The organic matter content is moderately low. The surface layer and subsoil are strongly acid to neutral.

The seasonal high water table severely limits the use of this soil for building sites and sanitary facilities. Ditches that control the water table are effective to some extent. Houses without basements are better suited to this soil than those with basements. Excavation is limited during winter and spring by the high water table and caving of banks. Local roads can be improved by using artificial drainage. Wetness and the sandy surface layer limit the use of this soil for recreation.

Table 17. St Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Severe: wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Severe: wetness
Septic tank absorption fields	Severe: wetness
Flooding frequency	None
High water table	Apparent - Jan. thru May at depths of 0.5 - 1.5 feet
Bedrock depth	Greater than 60 inches

EnB -- Elnora loamy fine sand, 1 to 5 percent slopes (86.2-acres)

This deep, nearly level and gently sloping, moderately well drained soil is on knolls and low ridges on the lake plain. Most areas are irregular in shape and range from 5 to 100-acres in size.

A seasonal high water table is at a depth of 18 to 24 inches in late winter, spring, and other extended wet periods. Permeability is moderately rapid or rapid. Runoff is slow. Available water capacity is low in the deep rooting zone. Organic matter content is low. The surface layer and subsoil are very strongly acid to slightly acid.

Seasonal wetness and moderately rapid or rapid permeability limit this soil for building sites and sanitary facilities. It is better suited to houses without basements than to those with basements. Because of seepage, contamination of ground water by sanitary facilities is possible. Sloughing is a hazard in excavations. Seeding should be done early in spring; if seeded during dry periods,

lawns should be mulched and watered. The sandy surface layer limits recreational use of this soil. This soil is a good source of sand.

Table 18. EnB Limitations

CHARACTERISTIC/USES	LIMITATIONS
Dwellings without basements	Moderate: wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Moderate: frost action, wetness
Septic tank absorption fields	Severe: wetness
Flooding frequency	None
High water table	Apparent -Feb. thru May at depths of 1.5 - 2.0 feet
Bedrock depth	Greater than 60 inches

Bs – Beaches (62.2-acres)

Beaches consist of sand and gravel washed and re-washed by waves along the shore of Lake Erie. They are partly covered by water during periods of high runoff. A fairly steep escarpment borders the land side of most beaches. Permeability is very rapid, and available water capacity is very low.

Most beaches are used for recreation, wildlife habitat, and aesthetic or scenic purposes.

Gr -- Granby sandy loam (58.0-acres)

This deep, nearly level, very poorly drained soil is in basin-like depressions on the lake plain. Slope ranges from 0 to 2 percent. Most areas are irregular in shape and range from 5 to 100-acres in size.

Unless artificially drained, this soil has a seasonal high water table near the surface for long periods. Permeability is rapid. The rooting depth is related to the depth of the water table. The rooting zone is moderately deep or deep in most drained areas. Available water capacity is low. Runoff is very slow. Organic matter content is moderate. The surface layer and subsoil are medium acid or strongly acid except where the surface layer has been limed.

Prolonged wetness severely limits use of this soil for building sites and sanitary facilities. Sloughing is a hazard in excavation. Suitable base material and artificial drainage are commonly required for roads.

Table 19. Gr Limitations

CHARACTERISTIC/USES	LIMITATIONS
Dwellings without basements	Severe: wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Severe: wetness
Septic tank absorption fields	Severe: wetness
Flooding frequency	None
High water table	Apparent - Nov. thru June at depths of 0 - 1.0 feet
Bedrock depth	Greater than 60 inches

PsA -- Platea silt loam, 0 to 2 percent slopes (56.2-acres)

This deep, nearly level, somewhat poorly drained soil is on broad flats on the uplands. The smaller areas, 5 to 10-acres in size, are oblong to oval in shape. The larger areas, 20 to 100-acres in size, are irregular in shape.

A perched seasonal high water table is above the very slowly permeable fragipan in winter, spring, and other extended wet periods. This soil dries slowly in spring. Runoff is slow. The rooting zone is mainly 24 to 28 inches deep over the fragipan. Available water capacity is low in

the rooting zone. Organic matter content is moderately low. The subsoil above the fragipan is very strongly acid to medium acid, but the surface layer varies widely in reaction, depending on the amount of liming.
Seasonal wetness and very slow permeability severely limit the use of this soil for building sites and sanitary facilities. Houses without basements are better suited to this soil than those with basements. Building sites should be landscaped for surface drainage away from the foundation. Local roads can be improved by using artificial drainage and suitable base material. Wetness also limits use of this soil for recreation.

Table 20. PsA Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Severe: wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Severe: low strength, wetness, frost action
Septic tank absorption fields	Severe: percs slowly, wetness
Flooding frequency	None
High water table	Perched - Jan. thru April at depths of 0.5 - 2.0 feet
Bedrock depth	Greater than 60 inches

CxA -- Conotton loam, 0 to 2 percent slopes (21.9-acres)
This deep, nearly level, somewhat excessively drained soil is mainly on outwash terraces. A few areas are on post-glacial beach ridges. Most areas are long and narrow in shape and range from 5 to 30-acres in size.
Permeability is rapid, and available water capacity is low in the deep rooting zone. This soil warms early in spring. Runoff is slow. The organic matter content is low. The subsoil is very strongly acid to neutral, but the surface layer varies widely in reaction, depending on the amount of liming.
This soil is suited to building sites. Possible contamination of ground water limits the use for sanitary facilities. Lawn seedings are difficult to establish during the drier part of the year. Seeding should be done early in spring; if seeded during dry periods, lawns should be mulched and watered.

Table 21. CxA Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Slight
Dwellings with basements	Slight
Local roads and streets	Moderate: frost action
Septic tank absorption fields	Slight
Flooding frequency	None
High water table	Greater than 6 feet
Bedrock depth	Greater than 60 inches

ElC -- Ellsworth silt loam, 6 to 12 percent slopes (21.1-acres)
This deep, sloping, moderately well drained soil is on hillsides and on side slopes parallel to drainageways. Most areas are irregular in shape and range from 5 to 20-acres in size.
A perched seasonal high water table is between depths of 1.5 and 3.0 feet during winter, spring, and other excessively wet periods. This soil dries slowly in spring. Permeability is slow or very slow. Runoff is rapid. The rooting zone is moderately deep over glacial till. Available water capacity is moderate. Organic matter content is moderately low. The surface layer and upper

part of the subsoil are very strongly acid to neutral, and the lower part of the subsoil is slightly acid to mildly alkaline.
Wetness, slope, slow or very slow permeability, and shrink-swell potential limit the use of this soil for building sites and sanitary facilities. Homes without basements are better suited to this soil than those with basements. Erosion is a serious hazard during construction, so cover should be maintained on the site as much as possible during construction. Trails in recreational areas should be protected from erosion and established across the slope wherever possible. Some areas are suitable sites for ponds.

Table 22. ElC Limitations

CHARACTERISTIC/USES	LIMITATIONS
Dwellings without basements	Moderate: slope, shrink-swell, wetness
Dwellings with basements	Severe: wetness
Local roads and streets	Severe: low strength, frost action
Septic tank absorption fields	Severe: percs slowly, wetness
Flooding frequency	None
High water table	Perched - Nov. thru May at depths of 1.5 - 3.0 feet
Bedrock depth	Greater than 60 inches

Po -- Pits, gravel (20.3-acres)
Gravel pits consist of surface-mined areas from which aggregate material has been removed for construction. Gravel pits are on beach ridges and out-wash terraces. Typically, they are associated with Conotton, Otisville, Tyner, and other soils that are underlain by gravel and sand out-wash. Most pits range from 2 to 50-acres in size. Actively mined pits are continually enlarged. Most pits characteristically have a high wall on one or more sides.
The material that is mined consists of stratified layers of gravel and sand of varying thickness and orientation. The kind and grain size of aggregate are relatively uniform with any one layer but commonly differ from layer to layer. Some layers contain a significant amount of silt and sand. Selectivity in mining is commonly feasible.
The material that remains after mining is poorly suited to plants. The organic matter content and available water capacity are low.
Most unused gravel pits can be developed as wildlife habitat or as recreation areas. They are commonly not used for farming or woodland.

Ur -- Urban land (14.5-acres)
Urban land consists of areas 10-acres or more in size that are covered by buildings, pavements, or other man-made surfaces. Included in Urban land are commercial and industrial areas, large factories, shopping centers, warehouses, and railroad yards. Slope ranges from 0 to 6 percent. Much of the total area is covered by construction, leaving only a limited acreage of natural soil. This results in increased volume and rate of runoff from these areas. Urban land is a potential source of pollution to nearby streams.

Ad -- Adrian muck (6.4-acres)
This deep, level, very poorly drained organic soil is in depressional areas on the lake plain. It is subject to frequent flooding. Slope is generally less than 2 percent. Most areas are elongated in shape and are 5 to 20-acres in size.
This soil has a seasonal high water table near the surface, and the surface is ponded for long periods in winter, spring, and early summer. Permeability is rapid. Rooting depth is strongly influenced by the depth to the water table. The rooting zone is mainly the upper 12 inches.

Available water capacity is high, and organic matter content is very high. The organic layers are strongly acid to slightly acid.
Most of the acreage of this soil is in natural vegetation, such as sedges and water-tolerant trees. This soil has poor potential for farming, building sites, and sanitary facilities. Undrained areas have good potential for wetland wildlife habitat.
Flooding, wetness, and rapid permeability seriously limit the use of this soil for building sites and sanitary facilities. Sloughing is a concern when making excavations. Some areas provide good sites for dugout ponds or wildlife marshes.

Table 23. Ad Limitations

CHARACTERISTIC/USES	LIMITATIONS
Dwellings without basements	Severe: wetness, floods, & low strength
Dwellings with basements	Severe: wetness, floods, & low strength
Local roads and streets	Severe: wetness, floods, & low strength
Septic tank absorption fields	Severe: wetness & floods
Flooding frequency	Frequent - long duration - Nov. thru May
High water table	Apparent - Nov. thru May at depths of 0 - 1.0 feet
Bedrock depth	Greater than 60 inches

PeC2 -- Pierpont silt loam, 6 to 12 percent slopes, moderately eroded (0.6-acres)
This deep, sloping, moderately well drained soil is on hillsides and side slopes parallel to drainageways. Most areas are irregular in shape and range from 10 to 200-acres in size.
A perched seasonal high water table is on the slowly or very slowly permeable fragipan in winter, spring, and other extended wet periods. Runoff is rapid. The rooting zone is mainly 18 to 30 inches deep over the fragipan. Available water capacity is low in the rooting zone. Organic matter content is low in the surface layer. The subsoil above the fragipan is strongly acid or very strongly acid, but the surface layer varies widely in reaction, depending on the amount of liming.
The slowly or very slowly permeable fragipan, slope and seasonal wetness limit the use of this soil for building sites and sanitary facilities. This soil is better suited to houses without basements than to those with basements. Cover should be maintained on the site as much as possible during construction to reduce the severe hazard of erosion. Local roads can be improved by using artificial drainage and suitable base material. Trails in recreational areas should be protected from erosion and established across the slope wherever possible.

Table 24. PeC2 Limitations

CHARACTERISTIC/USE	LIMITATIONS
Dwellings without basements	Moderate: wetness, slope, low strength
Dwellings with basements	Severe: wetness
Local roads and streets	Severe: low strength, frost action
Septic tank absorption fields	Severe: percs slowly, wetness
Flooding frequency	None
High water table	Perched - Jan. thru April at depths of 1.5 - 3.0 feet
Bedrock depth	Greater than 60 inches

More than 8600-acres of the soil types found in the watershed, that is 60% of the surface area, are listed as having severe limitations for development. Figure 7 shows the location of the different soil types in

the watershed. Figure 8 shows the drainage characteristics of those soil types. Figure 9 shows the soils with steep slopes in the watershed. Figure 10 shows the soils with high water tables.